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Marginally outer trapped surfaces governed by Bakry-Émery Ricci curvature bounds

Recent efforts to define energy conditions synthetically often assume a reference measure on spacetime. In the smooth context, reference measures arise in many applications. In a warped product (Kaluza-Klein) spacetime the reference measure describes the volume of the fibre (internal space), and in conformally invariant formulations of some classical theorems the reference measure provides a conformal scale factor. The corresponding generalization of Ricci curvature is the Bakry-Émery Ricci curvature. Using this approach, I will give a conformally invariant formulation of the Penrose singularity theorem and then explore constraints on horizon topology when the dominant energy condition is replaced by a Bakry-Émery type condition. This can be thought of as the dominant energy condition applied only to “base null directions” in a warped product.

The talk is based on recent work with Eric Ling and Argam Ohanyan.